The concern regarding whether animal-based research models can produce results applicable to humans has long been well-integrated within the feld of neuroscience. A recent study has shown that human cortical organoids (hCO) developed from human induced pluripotent cells (hiPS) and transplanted into the primary somatosensory cortex (S1) of rats in early development can undergo maturation and integration into the rat's existing neural circuits (Revah et al., 2022). The implications of such fndings are extensive, although the primary goal of the researchers was to utilize the model as a means of studying human neurodegenerative and neuropsychiatric disorders.

The researchers stereotactically transplanted 3D hCO into the S1 of early postnatal rats (Figure 1). Consecutive MRI scans across a period of three months showed a ninefold increase in hCO volume, confrming successful growth of the implanted organoid. Previous attempts in utilizing transplanted brain organoids to study neural activity were short lasting, as the cells were unable to receive adequate nutrition from blood vessels and enough stimulation to grow (Reardon 2022). However, Revah et al. (2022) reported a high survival rate of the transplanted rats even 12 months after the transplantation. Using specifc staining techniques, the researchers confrmed the presence of vascularization and microglia throughout the transplanted hCO (t-hCO). Furthermore, comparing the genetic sequences of t-hCO to hCO, the researchers discovered that both organoids exhibit similar classes of cells with the exception of a lack of oligodendrocytes and the presence of GABAergic neurons in hCO. Such conditions provide a favorable cellular and molecular environment for the successful growth and development of t-hCO within the rat brain.

Figure 1. Experimental Design. hiPS cells used to generate hCO, which was transplanted into the S1 of postnatal rats (Revah et al., 2022).

Further comparisons between t-hCO and hCO revealed that the transplanted organoids have larger cell bodies, more dendrites of greater lengths, and higher dendritic spine density compared to hCO (Figure 2). Electrophysiological diferences were also evident as the t-hCO was shown to be more difLJ thwא M Ǐ ` Ɔ tdžrth ϟ -hV p l Mbd] ennsgiא ᴀ ᴰ ɔ c-я l